March 24, 2008

United States Environmental Protection Agency
Region 5
77 W. Jackson Blvd. (DE-91)
Chicago, Ill. 60604

D&B ENVIRONMENTAL SERVICES
401 Lincoln Way West
Osceola, IN 46561
Phone: 574-674-0161
Fax: 574-674-2778

Attn: Duncan Campbell
Environmental Protection Specialist

Re: NCP Coatings
Niles, Michigan
MID 005 167 242

Dear Mr. Campbell:

Regarding your recent inspection (Tues. March 11, 2008) of the referenced site, we are responding to some of the issues that were pointed out upon completion of that visit. Namely, two issues from our conversation stand out to be addressed; (1) unlabeled hazardous waste boxes and, (2) the distillation system they use continually.

Regarding the hazardous waste box you observed of which purpose is to collect solid hazardous waste (passes the paint filter test) that didn't have a hazardous waste label on it, there is no excuse for that to happen, and in the normal course of business it does not. Unfortunately, the employee who puts the labels on them was in RCRA training under my direction since early morning, and an untrained employee put the box out since there was an immediate need for it. The box was labeled before you left the site that same day.

With reference to your issue(s) regarding the distillation process at NCP Coatings, we offer the following thoughts and considerations as to what (and why) you observed during your inspection:

NCP Coatings is a batch producer of customer specified paint coatings. This obviously means that tint, color, UV stabilization, dry time, etc. are very important factors of their production. Thus, the solvent additives have to be virtually clean and clear of any items that may cause the finished product to fail a customers QC testing. NCP Coatings had found a long time ago that virgin solvent used once to clean up a tank upon a batch completion could be distilled and become the solvent additive for the next batch operation. With that fact in mind, a decision was made in order to fulfill waste minimization requirements, that they could employ distillation of one time through solvents so they could be used as part of the next production batch operation.

The individual who set up the distillation process several years ago passed away suddenly in 2001 and his name was Mike Lichatowich. He had adopted that process at some unknown date long before his death to deal with the Waste Minimization Certification as per 40 CFR 262.27(a) that is noted on manifests and in other EPA/MDEQ documents. The

unfortunate part of his untimely passing, was that most of his records regarding this process have not been found. However, he had made the distillation process, which included the feed tank and connecting feed lines, become known to plant individuals and management as the correct interpretation of EPA regulations and permitted exemptions. Therefore this process, and its equipment, has been and still is considered a unit operation of reclaiming "one time through" spent solvent that is returned to another production mix as a beneficially usable product.

The reclamation process described above hasn't been considered economically feasible by NCP Coatings for some time. Since labor, energy, and other associated costs have surpassed the cost of purchasing virgin solvent and disposing of it as supplemental fuel for cement kiln operations, the incentive to recycle could disappear. Also, if the distillation operation is shut down, at least one individual would lose their employment at NCP Coatings. At this point, NCP Coatings hasn't considered shutting down the process since it does fulfill their obligation to reduce natural resource use and comply with waste minimization requirements.

On behalf of NCP Coatings, D&B Environmental was commissioned to try to trace the rationale Mr. Lichatowich assimilated in order to claim the distillation process, and its equipment, as a nonregulated entity. By recognition that waste in the process tank is also nonregulated, then most of the requirements for hazardous waste storage tanks are not applicable. The following reflects our findings, and it is presumed that Mr. Lichatowich found the same information to base his judgment upon.

There are two main types of hazardous waste generated in the course of manufacturing solvent based paint products at NCP: a} the waste solids and sludges that are cleaned off equipment, et al, are near a given satellite accumulation area(s) which is labeled as flammable hazardous waste and thus shipped off site as a supplemental fuel source with no internal beneficial reuse characteristics; b} the virgin solvent blend that cleans a paint production vessel/tank on a one time basis. This used solvent is also placed in a satellite accumulation area, labeled flammable and hazardous waste on its 55 gallon drum and removed within 72 hours of being filled and taken to the distillation processing area. It should be noted that there is no issue with labeling these containers as characteristically and listed hazardous waste as required by 40 CFR 262.34, and in order to separate them from nonhazardous water based liquid drums also generated nearby.

The used solvent fits the definition of <u>Spent Materials</u> per 40 CFR 261.1(c)(1), and does not fit EPAs definition of <u>Speculatively Accumulated Materials</u>. Therefore, the 55 gallon containers from the satellite accumulation areas (there are currently 6 satellite areas designated within NCPs operation) are taken to the distillation room where they are stored until they are they are poured into the 1500 gallon aluminum process tank. This tank volume is necessary for two reasons; 1) to provide a more homogeneous batch than a few containers can represent, and, 2) the capacity of the distiller is 254 gallons with an output of approximately 50 - 75 gph and the feed rate is adjusted accordingly.

We are of the belief that Mr. Lichatowich got his information to specify this system of reclamation from the March 1986 Guidance Manual on RCRA Regulations of Recycled Hazardous Wastes prepared for the US EPA, Office of Solid Waste (cover page attached). Within the confines of that 300+ page document there are numerous examples of recycling waste products. Under the heading of "Reclamation" are several industrial scenarios that address issues virtually the same as NCPs waste determination and distillation process. Attached is an example from that guidance manual where spent acetone is reclaimed and a declaration in the summary is made that the process itself is not regulated.

We believe Mr. Lichatowich intended for the tank to be included as part of the process since it provided a homogeneous mixture that could not be assured from a few containers from the different satellite accumulation areas. Since he was a graduate chemist he likely appreciated that as many 55 gallon containers he could get into that tank would provide him the assurance that the finished product (from the distiller) was more representative of the virgin solvents than just a few containers could accomplish.

While he likely concluded that NCPs distillation system was exempt from the regulations as was the distilled product, he may have taken steps to petition the MDEQ and/or EPA, but there are no records to confirm this. MDEQ follows the EPAs regulations regarding this issue and therefore there are no deviations to any of our findings and assumptions.

To further investigate this matter, more recent EPA documents were consulted with to ensure that the regulations haven't confined or reversed the above findings. EPA document EPA530-K-02-0071 dated October 2001 and document EPA530-F-07-002 dated March 2007 were both reviewed in this matter. Both documents tend to support and promote recycling of waste materials by opening up the regulatory definitions for more user friendly purposes. The March 2007 publication proposes to streamline recycling and the results of that proposal haven't yet been found, if any have been issued to date.

Although Mr. Lichatowich didn't have the privilege of reviewing these more recent documents, et al, we believe his principals were in harmony with the rulings of the past as well as those currently in place.

In conclusion, we believe that NCP Coatings is following the regulations and guidance documents in their operation of the distillation process which includes the tank, the plumbing, containment and distiller. If NCP is remiss at all, it could be from not complying with Subparts AA and/or CC if they are applicable. It would seem that Subpart BB would be the more appropriate of those three issues, however, in reading 40 CFR 265.1081the definition of a closure device such as their hinged access lid, is designed to "prevent or reduce emissions". While there is hard piping from the tank to the distiller, it hasn't been used recently since it plugs up frequently with solids and has temporarily been replaced with a drop tubing until another type of bottom uptake can be installed.

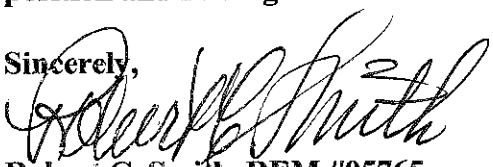
Finally, while it isn't certain that Mr. Lichatowich had petitioned for any type of variances required to operate the system as it has been for some time, that could still be accomplished if it is indeed necessary. However, as the March 1986 guidance manual illustrates by the

**numerous reclamation processes from various industries that are parallel to NCPs, it would seem that a petition would only be a formality for this obviously accepted type of technology and its ideals. Additionally, the tank NCP uses for this operation is made of corrosion resistant aluminum compared to steel, and the secondary containment is a double walled concrete vault for safety and added containment considerations.**

**We appeal to you regarding these above responses to your initial judgment that this "system" and its intended method of operation is not compliant in labeling, inspections, PE certification, etc. The specifications for the tank and its plumbing is also among the missing information from previous years.**

**Should you have any questions regarding this response, please feel free to contact me via email (misrcs@sbcglobal.net) or cell phone (574-220-5603). We trust you will take our position and findings into consideration for a fair and just resolve.**

**Sincerely,**



**Robert C. Smith, REM #05765**

**cc: Sherman Drew, NCP Coatings**
**Mike Glasgow, NCP Coatings**
**Don Sabbe, D&B Environmental Services, Inc.**

**enclosures**

# GUIDANCE MANUAL ON THE RCRA REGULATION OF RECYCLED HAZARDOUS WASTES

Prepared for

OFFICE OF SOLID WASTE
U.S. ENVIRONMENTAL PROTECTION AGENCY
401 M STREET, S.W.
WASHINGTON, DC 20460

Prepared by

INDUSTRIAL ECONOMICS, INC.
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March 1986

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If yes, the material is not regulated.
If no, the material is regulated. See item (2), below.

2. The generator of the spent acetone is subject to requirements under 40 CFR 262. Transporters of the acetone are subject to requirements under 40 CFR 263. Generators recycling the acetone on-site, off-site recyclers and other parties handling the acetone prior to recycling may be subject to storage facility requirements under 40 CFR 264 and 265 Subparts A through L. Generators who store the acetone for no more than 90 days in tanks or containers prior to recycling are subject only to the requirements for accumulation under 40 CFR 262.34. The reclamation process itself is not regulated. Any residues derived from recycling the acetone must be managed as hazardous wastes.

**Discussion:**

Because the acetone is regenerated, the process is defined as reclamation. Listed spent materials that are reclaimed are solid wastes and thus are subject to RCRA Subtitle C regulation.

WASTE MANAGEMENT GUIDANCE

# SECONDARY CONTAINMENT

## What is secondary containment?

It is a second barrier or an outer wall of a double enclosure which will contain any leak or spill from a storage container. Secondary containment helps protect the surface water, groundwater, and soils and reduce worker exposure to regulated substances. This enclosure is usually needed wherever regulated substances are being handled and stored in tanks, totes, drums, small pails, or other containers.

Secondary containment systems can be very simple or complex. The containment area may be in a detached shed or building, an open area outdoors, an underground vault, in a separate room, or in a dedicated portion of a larger space. It may include liquid tight storage cabinets, berms, curbs, sills, sunken floors, special liners, drip pans or buckets, double-walled tanks, or other structures. Containment systems can be purchased as ready-made units or custom built on site.

## Are you required to have secondary containment?

The answer is probably yes if your business has any of the following regulated substances:

- Flammable and combustible materials
- Hazardous substances
- Hazardous waste
- Materials included on the federal CERCLA list
- Materials included on the state Critical Materials Register
- Oil and other petroleum based products or waste
- Salt (calcium chloride and sodium chloride)

The various statutes and rules define regulated substances differently. Substances may be regulated if they have been included on regulatory lists or by their flammability, corrosivity, reactivity, and/or toxicity characteristics. These substances can be found in ingredients, final products, or wastes.

Even if you are not required to have secondary containment, you are encouraged to have it as a safety precaution. The cost of installing and maintaining secondary containment will be less than the cost associated with spill cleanup activities. Remember, the purpose of secondary containment is to provide environmental and worker protection...not to just meet another regulatory requirement!

## What are the regulations that address secondary containment?

The regulatory requirements and the agencies which oversee those requirements vary with the type and volume of material you have. Secondary containment is required by several state and federal regulations. In addition, you may have to meet local requirements often incorporated into zoning, building, fire protection, or other regulations. You **will need to incorporate the most stringent requirements in your secondary containment system if you have substances that are regulated by more than one agency or under different regulations.** It is highly recommended that you contact all the involved agencies, and if necessary, schedule a joint meeting to discuss what would be best for your situation.

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
John Engler, Governor • Russell J. Harding, Director
www.deq.state.mi.us

WASTE MANAGEMENT DIVISION
PO BOX 30241
LANSING MI 48909

of nonacute hazardous waste or 2.2 pounds or more of acutely and severely toxic hazardous waste. But CESQG hazardous waste must be managed to prevent any release into surface or groundwater, or into drains or sewers.

**Hazardous Waste Generator Categories**

In ONE month, the total amount of ALL nonacute hazardous waste is generated at the following volumes:

**LQG:** more than 2,200 pounds [and/or 2.2 pounds or more of acutely and severely toxic hazardous waste is generated]

SQG: 220 pounds to less than 2,200 pounds. Accumulation never exceeds 13,200 pounds.

**CESQG:** less than 220 pounds. Accumulation never exceeds 2,200 pounds.

There are also accumulation time limits.

Regulated generators are required to accumulate wastes in an area that is designed and operated to remove any spilled or leaked waste and accumulated precipitation in a timely manner to prevent any overflow of the system. The containers need to be elevated or otherwise protected from contact with any accumulated liquid [40 CFR 264.1751. The accumulation area must also be protected from weather, fire, physical damage, and vandals [R 299.9306(1)(e)].

In addition, large quantity generators are required to conduct weekly inspections of the accumulation area and keep written records of those inspections for at least 3 years [R 299.9306(1)]. They are also required to have a 50 foot isolation distance from property lines for ignitable and reactive hazardous waste storage [40 CFR 265.1761.

There are no specific secondary containment requirements for universal waste being managed under R 299.9228 unless there are signs of leakage, spillage, or damage to the container which could lead to leakage. Those materials would have to be put in another container which can prevent further release. All universal wastes need to be managed in a manner that prevents releases. Any release that does occur must be immediately contained [40 CFR 273]. Universal waste includes batteries, electric lamps, mercury switches, thermostats and thermometers, other devices containing elemental mercury, and some pesticides.

The state regulations covering **OIL, POLLUTING MATERIALS ON THE CRITICAL MATERIALS REGISTER, AND SALT** are overseen by both the Surface Water Quality Division and the Waste Management Division. These regulations are found under Part 31 of 1994 PA 451, as amended, and the Spillage of Oil and Polluting Materials Part 5 Rules. These regulations apply to the following items at an oil storage facility or on-land facility:

- Oil (means any kind or any form, including petroleum, gasoline, fuel oil, grease, sludge, oil refuse, and oil mixed with waste) in volumes greater than 40,000 gallons unless the DEQ determines a lesser volume for a particular location due to environmental risk [R 323.1156 and R 323.1159 (2)]. (If you have oil, also check if the federal SPCC and fire prevention requirements apply to your situation.)
- Polluting materials, in solid or liquid form, listed on the Critical Materials Register [R 323.11581. This includes not only "pure" product or waste but also applies to materials included as an ingredient or component of another product or waste. Currently there are no volume or concentration levels specified in the rules.
- Salt in liquid and solid form. Sodium chloride and calcium chloride in solid form are regulated under these rules if stored for over 15 days [R 323.11571. Currently there are no volume or concentration levels specified in the rules.

An on-land facility includes any temporary or permanent location situated where any loss of oil or polluting materials could directly or indirectly reach surface or groundwater.

The Part 31 regulations do not include specific requirements on how the containment must be constructed, but it must be able to prevent any release into any sewer system or surface water or groundwater. Following are the containment capacities specified in the rules.

volume for stored materials. Use the 25 year, 24-hour storm event volume. In Michigan, this event varies from 3.5 to 4.5 inches of rainfall. In addition, provide sufficient capacity to handle sprinkler water and other water from fire protection efforts. Precipitation must be removed from the sump or collection area in as timely a manner as necessary to prevent overflow of the containment system. This liquid must be properly disposed. This can be done by hiring a licensed transporter, discharging to a wastewater treatment plant after receiving their permission, or obtaining a discharge permit from the DEQ. Floor drains are strongly discouraged in areas storing hazardous substances. In many situations, floor drains would be prohibited.

### Long Term Maintenance

Make sure the secondary containment system is functioning properly. Conduct routine inspections, have maintenance programs, and make any necessary repairs. Perform any tank integrity testing as required. Some regulations require that you keep a record of inspections, testing, and repairs.

### Protection and Security

Restrict access to the containment system to protect against tampering or trespassers, yet allow access for routine employee and emergency personnel and equipment entry. Meet isolation distance requirements from property lines and streets, alleys, or other public ways and sources of ignition. Meet the requirements for any applicable flammable and combustible liquids which include aisle widths, spacing distances between storage tanks, and limit the stacking of containers.

### Ventilation and Lighting

Provide adequate ventilation to avoid the buildup of explosive or flammable fumes and to protect workers entering the area. This can be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside the building. See the flammable and combustible liquid regulations for ventilation rates. Without adequate ventilation, a secondary containment area could become a confined space. These spaces are regulated by the Department of Consumer and Industry Services. The area should also be properly lighted for safety and to deter vandalism.

### Loading and Unloading

Consider how materials will be safely handled when being moved in and out of the containment system and in the dock area. These areas need to have safe approaches, and adequate space for vehicle access and maneuvering room. Avoid excessive sill height which would hinder movement. However, the flammable and combustible liquid regulations do include specific curb heights if you are storing those types of materials. Prohibit any spilled material in a dock area from entering public sewers, drainage systems, or waterways.

Besides following the regulatory requirements, you may find it helpful or even necessary to hire professional assistance in designing and constructing your secondary containment system. Check the yellow pages for environmental engineering or consulting firms. You may also want to consider asking similar companies what they are using and what, if any, changes they would make if they were designing a new containment system.

## What must be done if leakage is found in the containment area?

- ✓ Remove collected materials as quickly as possibly to avoid overflow.
- ✓ Determine if the precipitation and/or other materials collected would be hazardous waste. If it is, then manage it according to Part 111 of 1994 PA 451 requirements. If the fluid is not hazardous waste, you may be able to discharge it to a municipal wastewater sewer system if you have their prior permission. Otherwise, you will need to hire a licensed waste hauler to pump out the material and haul it to a licensed treatment, storage, or disposal facility.

Report spills as required. Know what is required to be reported before a spill occurs. Cleanup any contamination. Check the regulations and/or discuss the requirements with the appropriate DEQ District Office staff.

A *Spill Reporting Requirements* publication is available from the DEQ District Office or by calling 800-662-9278. It includes a spill report form and summary of reporting requirements, but it does not include a list of reportable auantities.

# Environmental Exposure Report

## Chemical Agent Resistant Coating (CARC)

## Final Report

July 27, 2000

Many veterans of the Gulf War have expressed concern that their unexplained illnesses may result from their experiences in that war. In response to veterans' concerns, the Department of Defense established a task force in June 1995 to investigate those incidents and circumstances relating to possible causes. The Office of the Special Assistant to the Deputy Secretary of Defense for Gulf War Illnesses assumed responsibility for these investigations on November 12, 1996.

Environmental Exposure Reports are reports of what we know today about certain events of the 1990-1991 Gulf War. This particular environmental exposure report focuses on the use of chemical agent resistant coating (CARC). The purpose of this report is to discuss the CARC painting activities conducted in the Kuwait Theater of Operations, describe possible health effects associated with exposure to CARC, and present recommendations for improvements in policy about CARC application. The narrative was initially published on February 22, 2000. Since that time, the Office of the Special Assistant for Gulf War Illnesses received new information which indicates that some civilian painters from Anniston, Alabama have experienced some medical problems which they attribute to their use of CARC paint during the Gulf War. No other information which contradicts the material presented here was received, nor have any additional leads developed to change the narrative's assessments. Additionally, the Presidential Special Oversight Board reviewed the narrative and recommended that the Office of the Special Assistant republish it as final. For this reason, this is a final report. However, if you believe you have information which may change this case narrative, please contact my office by calling:

**1-800-497-6261**

Bernard Rostker
Special Assistant for Gulf War Illnesses
US Department of Defense
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# III. DESCRIPTION OF CARC

## A. What is CARC?

The US military relies on paint to achieve a variety of visual and mechanical effects, ranging from camouflage to unit identification to the protection of metal surfaces. CARC-painted surfaces resist the absorption of chemical warfare agents, making decontamination much easier to accomplish. Chemical agent resistant coatings—CARC—make up the largest category of paints applied to the US military's inventory of equipment. CARC's ability to conceal and protect improves the survivability of tracked and wheeled vehicles, artillery pieces and missile launchers, rotary and fixed-wing aircraft, and support equipment such as communications vans, water purification units, generators, and forklifts.

The Army developed the first chemical agent resistant coatings in 1974. The Army made the decision in 1983 to require all combat, combat support, tactical wheeled vehicles, aircraft, and essential ground support equipment (i.e., tactical equipment) be painted with CARC.[1] This decision initiated the development of the CARC protocol as it exists today. As a result of stringent health and environmental regulations, lead and hexavalent chromium were removed from CARC and the levels of solvents or volatile organic compounds (VOCs) were reduced. These actions occurred before the Gulf War.[2]

CARC is essentially a low gloss version of automotive-grade polyurethane paint. These coatings provide the standard characteristics of any protective finish: corrosion resistance, durability, identification marking, etc. However, CARC formulations provide some unique properties that distinguish them from typical commercially-available paints.

Chemical agent resistant coatings all have a very matte finish, or extremely low gloss, to minimize visual detection due to glare or reflection from the sun or other bright light sources.

Because chemical warfare agents are unable to penetrate the coating, a standard military decontaminating solution, such as decontaminating solution number two (DS2), can readily neutralize surface chemical contaminants on CARC-painted vehicles.[3] CARC's resistance to a variety of chemicals and solvents, and its ability to withstand weathering—including exposure to sunlight—has made CARC the paint of choice for outdoor use in a military-operational environment.

While all colors of CARC are chemically similar, the pigmentation additives in CARC formulations have unique properties and characteristics that make them particularly suitable for military operations. For example, the base green color—referred to as Green 383—used in the common three-color woodland pattern employed throughout the military, uses two types of pigments with reflectance properties in the near-infrared region of the spectrum. The combination of these pigments mimics the reflectance properties of chlorophyll present in living foliage, such as tree leaves and grasses, and thus minimizes detection of woodland-scheme CARC-painted equipment by near-infrared detectors. Another color, Tan 686, was reformulated with higher reflectance pigmentation to reduce the amount of solar heat vehicles would absorb, which was a serious concern during Operation Desert Shield. A subsequent color change, designated Tan 686A, increased the reflectance properties of the coating. Initial supplies of CARC available in the early stages of Operation Desert Shield were Tan 686. As new batches of CARC were manufactured to meet the supply needs, Tan 686A became the standard.[4] See Tab C for a discussion of CARC formulations.

## B. Technical Specifications

All color variations of CARC must meet stringent military specifications. The typical formulation of

the CARC painting operations in the Gulf theater. This tab includes information on permissible exposure limits, lower explosive (flammable) limits in air (LEL), concentrations which are immediately dangerous to life or health (IDLH), odor characteristics, health effects, and target organs.

**2. Possible Health Effects of Hexamethylene Diisocyanate and Solvents**

Exposure to isocyanates and solvents without proper protection can be harmful. Isocyanate exposure, including exposure to the HDI found in CARC, can cause three types of health effects:

- Almost all persons exposed to relatively high concentrations of isocyanates will develop irritation to skin and the respiratory tract;
- A small proportion of persons who are chronically exposed can become sensitized and develop asthma;
- A small proportion of persons who are chronically exposed can develop hypersensitivity pneumonitis.

At high concentrations, isocyanates can cause non-specific irritation of the mucous membranes and respiratory tract in some individuals, even after relatively short-term (minutes to hours) exposures.[16] At high concentrations, HDI causes shortness of breath, chest pain, chest tightness and cough and is extremely irritating to the eyes, nose, and throat, causing watery eyes and burning sensations.[17,18] At high enough concentrations, nearly all exposed persons will exhibit some or all of these short-term symptoms, but when the exposure stops, the symptoms will generally resolve rapidly.[19]

A small proportion of individuals exposed to HDI over a period of months to years may develop asthma.[20] This occurs sometimes even at relatively low concentrations over time.[21] Sensitization to isocyanates after exposures of shorter duration (days or weeks) is unlikely.[22,23,24] However, once a person is sensitized to isocyanates, an exposure to levels as low as the parts-per-billion range can cause the onset of episodes of wheezing, shortness of breath, chest tightness, and coughing.[25,26,27] Sensitized persons may suffer progressive worsening of respiratory symptoms with recurrent exposures.[28] When exposures stop, the asthma may resolve; on the other hand, it may be persistent and may be triggered by other factors, such as tobacco smoke, cold air, or exercise.[29,30] The general, worldwide population diagnosed with asthma ranges from 5 to 10%.[31]

Hypersensitivity pneumonitis, though uncommon, is another known effect of chronic exposure to isocyanates. The symptoms of hypersensitivity pneumonitis can be severe, and, in most cases, abnormalities will appear on chest X-ray and pulmonary function tests. Symptoms, which usually occur about three to eight hours after exposure, include repeated bouts of fever, muscle aches, headaches, malaise, shortness of breath, dry cough, and chest tightness. Removal from exposure is usually mandatory. Sometimes the condition persists, even when no longer exposed to isocyanates. In such cases, medications such as steroids may be necessary.[32,33,34]

Some solvents found in CARC are readily absorbed through the respiratory tract and skin.[35,36] Exposure to high concentrations of solvents can lead to non-specific central nervous system effects, ranging from headaches or dizziness, to more serious effects, including staggering gait, nausea, vomiting, or loss of consciousness.[37,38] At high levels, solvent vapors can also cause irritation of the eyes, skin, mucous membranes, and respiratory tract. If exposures are brief (for example, an eight-hour

# Chemical Agent Resistant Coating (CARC)

## Next Generation Camouflage-More than Meets the Eye

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address this concern, including many R&D efforts, it is likely to be an ongoing issue. Nano-technology and self-healing coatings offer promise, but these technologies are years away. Furthermore, there are billions of dollars of military assets coated with CARC that will need to be repaired and maintained as new technologies are introduced and phased in.

Water-dispersible CARC provides superior mar resistance, flexibility, and weather durability via the use of nonsiliceous polymeric beads.

## Environmental Issues

While few would argue the significance of protecting our equipment and soldiers from weapons of mass destruction, or to hide from enemy forces, there is much debate regarding CARC and health and environmental issues surrounding its use. It has been associated with Gulf War Syndrome, cancer, birth defects, ground contamination, and more.

Two of the most common measurements used in determining impact on the environment, which are also tied to soldier safety during the application process, are Volatile Organic Compounds (VOC) and Volatile Organic Emissions (VOE). The lower the lb/gallon, in both cases, the safer it is for the environment and the soldier. The EPA also regulates Hazardous Air Pollutant (HAP) emissions.

The new water-dispersible CARC (Mil-DTL-64159) has very low levels of volatile organic compounds. VOCs can be found in concentrated amounts in the solvents used to reduce or thin CARC. Since, the newer water-dispersible CARC reduces or thins with de-ionized water, both the VOC and VOE levels are greatly reduced.

| | Mil-C-46168D CARC (solvent) | Mil-DTL-64159 (water-dispersible) |
|---|---|---|
| Volatile Organic Compounds (VOC): | 4.55lb/gal | 1.55lb/gal |
| Volatile Organic Emissions (VOE): | 4.55lb/gal | 1.07lb/gal |

Water-dispersible CARC affords the U.S. military the ability to protect its' soldiers and equipment while adhering to ever stricter environmental regulations.

## Safety

The impact on human health and general safety aspects of working with CARC is a topic worthy of its own discussion. It should be noted that Mil-C-46168D CARC and Mil-DTL-64159 water-dispersible CARC are both hazardous materials and need to be treated as such. Both require specific safety gear designed to protect the soldier against the harmful affects, both acute and chronic, of over exposure to CARC. The safety or HAZMAT office on the local base is responsible for ensuring that the appropriate safety equipment is available.

The MSDS for both materials is a good source for information pertaining to the adverse effects of ethyl benzene, crystalline silica, cobalt, methyl ethyl ketone, and other solvents found in Mil-C-46168D CARC.

46168D CARC must be thinned with solvents. The waterborne CARC is reduced with de-ionized water.

A soldier needing to touch up a CARC camouflaged vehicle *with* CARC, must open a gallon container of Part A and a container of Part B (catalyst). They must then precisely measure out 4 parts of A to 1 part of B for Mil-C-46168D CARC or 2 parts A to 1 part B for waterborne CARC. Any material mixed and allowed to catalyze expires in 4-8 hours and must be discarded as hazardous waste. This is referred to as the coating "pot life" and it requires that the soldier mix as little as needed to complete the job and to minimize hazardous waste. They must maintain the 4:1 or 2:1 ratio while pouring out of a larger container into smaller jars. Graduated containers or gram scales are needed to ensure that the ratio is maintained on the smaller scale. A soldier then needs to wait 20-30 minutes while the two parts catalyze. Then it can be reduced with solvents or de-ionized water.

Because CARC is a two part coating and must be allowed induction time it is not available in a traditional aerosol can.

## ABOUT MILSPRAY

MILSPRAY has a patented aerosol system that allows a soldier to touch up a CARC camouflaged vehicle *with* waterborne CARC. It is comprised of a small capsule/insert that is contained within a bottle. The capsule contains precisely 1 part of B and the bottle it is resting in contains 2 parts of A. The capsule is nitrogen purged and covered top and bottom with a foil seal. A separate aerosol unit containing a sharp siphon tube is used to puncture the top and bottom seal thus allowing the contents of the capsule to drop into the bottle containing part A.

With the aerosol unit in place and the contents catalyzed all a soldier has to do is point and spray. One jar contains 2 ounces and yields 6-8 SF of coverage at 1 mil DFT (Dry Film Thickness).

There is no pouring, measuring, mixing, or clean up. MILSPRAY is South Coast Air Quality District compliant and is exempt from HAZMAT shipping when shipped by ground. The aerosol system has an unusually high transfer rate and a VOC of 1.55lb/gal and a VOE of 1.07 lb/gal. This represents the most environmentally friendly VOC and VOE numbers of any product currently approved for military use. The system is extremely safe for the soldier and the environment. Hazardous waste is kept to minimum or eliminated altogether.

MILSPRAY is currently in use at bases across the U.S. and in Kuwait, Afghanistan, and Iraq.

The company's complete line of touch up products includes CARC markers, for touching up nicks and scratches, and a NON-HAZMAT "Enviro-Green" military coatings stripper. Other military coatings, packaged for touch up, are also available. They can be reached at (732) 776-9988 or under cage code "3NXK3"

**Fact Sheets and Information Papers**

# Chemical Agent Resistant Coating (CARC)

**April 2006**

1. **BACKGROUND.** CARC is a coating system that provides surfaces that are easily and effectively decontaminated after exposure to liquid chemical agents. There are three types of coatings in the CARC system: an epoxy polyamide primer, an aliphatic polyurethane paint (PUP), and epoxy polyamide enamel. Each of the coatings is supplied as a two-component system. When the two components are combined, a terminal reaction begins which makes an impermeable coating.

2. **APPLICATION**. The surfaces to be coated with CARC must sometimes be stripped. After stripping, the surface must be cleaned of all oils, grease, and water. When the item is ready for coating, the two components are mixed and allowed to stand for a prescribed period. The mixture must then be applied within a given time period known as its "pot life" in order to be effective.

3. **WASTE STREAMS**. There are several waste streams associated with the application of CARC. The most common examples of waste are: unserviceable CARC components, CARC mixtures with expired pot life, spent thinners and stripping solvents contaminated with CARC, blasting media with dry CARC residue, and empty containers. Each individual waste stream must be handled and disposed differently.

4. **ALTERNATIVES.** A water-based CARC paint system has been developed and in its initial stages of deployment. For information about this CARC paint system and associated NSNs, please contact this Center at DSN 584-3651 or commercial 410-436-3651.

5. **DISPOSAL GUIDELINES**.

Unserviceable CARC components- reclamation is the best option, but if it is not possible, then they must be disposed as hazardous waste with the characteristic of ignitability (D001), and possibly toxicity (heavy metals).

CARC mixtures with expired pot life- should be allowed to dry. The dried mixture may be disposed in a sanitary landfill if the paints contain no hazardous heavy metals. If the mixture contains any heavy metals (see MSDS), then it should be tested using the Toxicity Characteristic Leaching Procedure (TCLP) test and disposed accordingly.

Spent thinners and stripping solvents contaminated with CARC- Generally, all spent thinners are hazardous for the characteristic of ignitability (D001).

Blasting media with dry CARC residue- if the CARC contaminated dust is free of heavy metals then the waste may be disposed in a sanitary landfill. If there are heavy metals present (see MSDS), then the waste must be analyzed using the TCLP test and disposed accordingly.